tion" the Commissioners understand to be meant an institution for general education or for any special kind of education, which is not carried on for private gain or profit. Applications stating the applicants' qualifications should be addressed to the Secretary, Mr. T. Bailey Saunders, at the office of the Commission, 32 Abingdon Street, Westminster, S.W., on or before Saturday, May 13, 1899. It will, it is added, be convenient if teachers and lecturers in physics, chemistry, or other subjects, effective instruction in which requires laboratories and expensive apparatus, would state what resources of that character they have at their disposal. Teachers or lecturers on whose behalf applications have already been made by their colleges or schools need not repeat them.

AT a meeting held in University College, Bristol, on Thursday last, the Bishop of Hereford, President of the College, being in the chair, it was decided to found a University College Colston Society, holding an annual dinner in the same manner as the Grateful Dolphin, and Anchor Societies, but with a distinctly educational aim. It was pointed out by the Bishop of Bristol that not only were the Colston benefactions to education larger than to all other objects combined, but that the sums devoted to this object in Bristol by Edward Colston were larger than those which have given origin to the existing annuities and doles. It is hoped that a Colston endowment fund may thus be raised, and scholarships instituted to enable girls and boys who have shown promise to pass on to the College from schools and other institutions in the city. The University College has recently fallen heir to a legacy of 5000*l.* bequeathed by the late Mr. Stuckey Lean. This will probably be devoted to a much-needed extension of buildings. Both the Bishop of Hereford and the Bishop of Bristol expressed opinions favourable to the establishment in the near future of that University for the West of England, centred in Bristol, which Sir Norman Lockyer foreshadowed when the British Association recently met in that city. We cannot but believe that the citizens of Bristol will speedily follow the lead set them by the citizens of Birmingham, and take active steps to enable those who have the cause of higher education in the West of England at heart to realise the ideal thus placed before them.

ON Saturday last, in opening a new county school established at Presteign under the Welsh Intermediate Education Act, the Duke of Devonshire referred to the part he played in educational affairs. He remarked that he had on previous occasions had to protest against the assumption which seemed to have been made that he was, or professed to be in any degree, an educational expert. That was not the least the case. An educational expert should be a person who had himself received a very large and extensive education, and who had, in addition, devoted himself to the study of education, which was in itself a science and a profession. To neither of these could he lay the smallest claim. If, without the slightest pretension on his part, he had assumed to be in any sense an education advocate, it was because he had been for some considerable period deeply impressed with the national importance of the better training of the people in one branch, and that a very limited branch, of education—that was to say, in the teaching of science and of art as applied to our industries and to our commercial position. He had seen in many ways the close connection which existed between the discoveries and teaching of science and the efficiency and prosperity of our industries. He had seen how other countries appeared to be more alive to the existence of this close connection than we were ourselves, how in other countries the imparting of this kind of instruction had been made more the business of the State, and how they had been able to induce their people more fully to take advantage of the opportunities for this kind of education than we had hitherto succeeded in doing. But to see the necessity for this kind of technical training of the people, and to suggest the means by which it was to be provided, were two very different matters; and, although he had done his best to impress the views which he had formed on this subject on his fellow-countrymen, he had never professed, and he did not profess, to be an expert adviser as to the manner in which this technical training should be applied to our people.

Referring to the Board of Education Bill, the Duke of Devonshire said it had been his duty to bring in a Bill the object of which was the better organisation of education, and especially of secondary education. He thought the interests of the measure, which he believed to be an important one, might suffer if it were to be supposed that he, in the conduct of it, spoke as an educational expert with theories and ideas on education of his own, instead of being, as he was, merely a politician and an administrator charged with the duty of attempting to improve the organisation of our education with the assistance of experts who were much better qualified to advise and to give counsel than he was himself. This might be a good system or not a good system, but it was our system of government. We did not put a great strategist at the head of the War Department, or a skilful sailor, or a great shipbuilder at the head of the Admiralty. We selected ordinary statesmen or politicians to control these two great departments, requiring, as they did, the highest technical skill in the shape of skilled professional advisers. In his opinion, it would be a very great mistake indeed if we were to commit the charge of the Education Department to a professor, a schoolmaster, or an educational expert, however great might be the range of his studies, and however much he might have devoted himself to the study of the science of education.

SCIENTIFIC SERIALS.

Wiedemann's Annalen der Physik und Chemie, No. 2.—Propagation of electrodynamic waves along a wire, by A. Sommerfeld. To approximate to practical conditions, the author admits a finite thickness for the wire, and supposes it to be single, straight, and infinite. He shows that when the frequency is high and the wire thick, propagation takes place with nearly the velocity of light; but when that is not the case, the rate may be only three-quarters of that. All the occurrences are confined to a surface layer of the wire not more than 0·1 mm. thick.—Polarisation and hysteresis in dielectric media, by W. Schaufelberger. The loss of energy by hysteresis in a paraffin ellipsoid oscillating in an electrostatic field is proportional to the square of the electric force. Ebonite is, in comparison, a very imperfect dielectric.—Proportionality of emission and absorption, by W. Voigt. The author attempts to provide a theoretical foundation for Kirchhoff's law. He is obliged to assume the coexistence of irregular and heterogeneous waves, since regular wave-trains would not obey the law.—Canal rays, by A. Wehnelt. A mica cross introduced into the dark kathode space casts a shadow upon the kathode itself, thus proving that rays proceed from the anode to the kathode. Further, it is extremely probable that no kathode rays are given out except where anode rays impinge upon the kathode. When they penetrate the kathode, we have Goldstein's "canal rays."—A new method of detecting electric waves, by A. Neugschwender. A slit is cut in the silver surface of a mirror, and the latter is placed in circuit with a cell and galvanometer. No current is indicated until the mirror is breathed upon. But the deflection that is then shown is immediately annulled by the impact of electric waves upon the mirror. Conductivity is restored when the waves cease, provided there is a source of moisture, say a wet sponge, near the galvanometer.—Isolation of long heat rays by quartz prisms, by H. Rubens and E. Aschkinass. The extremely long heat rays obtained by successive reflections at surfaces of rocksalt and sylvine are transmitted by quartz, and their refractive index is thus easily determined. It is extremely high, being 2·19 for waves 56 μ long.—Continuity of the electric discharge in rarefied air, by Mr. Cantor. The author employs the coherer to test the continuity of the vacuum discharge under conditions where Hertz pronounced them to be absolutely continuous. In every case waves were given out by the tubes. But it is still possible that part of the discharge may have been continuous.

SOCIETIES AND ACADEMIES.

LONDON.

Entomological Society, April 5.—Mr. G. H. Verrall, President, in the chair.—Mr. Blandford exhibited insects of different orders collected by Dr. Albert L. Bennett in West Africa, and read some notes by Dr. Bennett on the habits of the Goliath beetles.—Mr. McLachlan exhibited young larvæ of a "locust," received from Mr. E. A. Floyer, Director-General of Telegraphy in Egypt, and said by him to have caused the *Calotropis* trees in Nubia to be in a moribund condition. The larvæ were identified by Mr. Burr as those of a species of *Poecilocerus*, probably *P. vittatus*, Klug.—Mr. Blandford gave an account of a paper by Dr. A. Ribaga, published in the "Rivista di Patologia Vegetale," v. p. 343, on an asymmetrical structure occurring in the adult female of the common bed-bug, and apparently hitherto overlooked, although it communicated with the exterior by a conspicuous notch in the fourth abdominal segment, midway between the median line and the lateral margin. This structure consisted of a large quasi-glandular mass of unknown nature in which was encapsuled an organ consisting of fibres, the free ends of which terminated in minute chitinous spines in a recess lying under the fourth abdominal segment. The adjacent margin of the fifth segment was thickened and set with strong teeth. The non-glandular part of this singular structure was conjectured by its discoverer to be a stridulating organ; but no evidence of stridulation had been obtained. It was certainly far more complex than most, if not all, other stridulating organs known to exist in insects.—Mr. G. J. Arrow communicated "Notes on the Rutelid genera *Anomala*, *Mimela*, *Popillia*, and *Strigoderma*."

Mathematical Society, April 13.—Lieut.-Colonel Cunningham, R.E., Vice-President, in the chair.—The chairman briefly referred to the loss the Society had sustained by the recent death of its foreign member, Prof. Sophus Lie.—Mr. A. B. Kempe, F.R.S., having taken the chair, Lieut.-Colonel Cunningham read a paper on conformal division. Major MacMahon, F.R.S., Messrs. Lawrence, Western, and the chairman joined in a discussion on the paper.—The following papers were communicated in abstract. On the characteristic invariants of an asymmetric optical system, Mr. T. J. Bromwich. The reduced path from one point to another is expressed in terms of the directions of the ray at those points. It is now found possible to put down eight invariants by inspection (only six are independent). These are expressed in terms of those given by Prof. Sampson (*Proceedings*, vol. xxix.). The remainder of the note consists in bringing the reduced path to two canonical forms and some geometrical interpretations.—Concerning the four known simple linear groups of order 25920, with an introduction to the hyper-Abelian linear groups, Dr. L. E. Dickson. (1) On the direct determination of stress in an elastic solid with application to the theory of plates; (2) on the stress in a rotating lamina; (3) the uniform torsion and flexure of incomplete tores with application to helical springs, Prof. J. H. Michell.—The theorem of residuation, Noether's theorem, and the Riemann-Roch theorem, Dr. F. S. Macaulay.—Impromptu communications were made by Messrs. Hargreaves, Heppel, Roseveare, Western, and the chairman. This last drew attention to the following curious properties of the number 7, viz.:—

$$\begin{aligned} 18^3 &\equiv +1, & 19^3 &\equiv -1 \text{ (mod. } 7^2 \text{ and } 7^3) \\ 1353^3 &\equiv +1, & 1354^3 &\equiv -1 \text{ (mod. } 7^4 \text{ and } 7^5) \\ 82681^3 &\equiv +1, & 82682^3 &\equiv -1 \text{ (mod. } 7^6 \text{ and } 7^7) \end{aligned}$$

but these properties do not extend to 7^8 and 7^9.

EDINBURGH.

Royal Society, April 3.—Prof. Duns in the chair.—Dr. R. Kennedy read a paper on the restoration of coordinated movements after nerve section, of which the following are some of the main results. The peripheral segment of the divided sciatic nerve was rotated to the extent of a semicircle before reunion to the central segment by means of suture. As a result of this, the nerve fibres of the central segment were brought into apposition with non-corresponding peripheral segments, and the nerve thus placed in the best conditions for the formation of new paths for the nervous impulses. Restoration of coordinated movements commenced on the seventh day after the operation, and was complete from the fourteenth to the twenty-first day. Despite this early restoration of function, the peripheral segment showed the presence of Wallerian degeneration and of complete regeneration of young nerve fibres, showing that early restoration of function was not due to healing by so-called first intention, but, instead, to regeneration of the peripheral segment. In one case in which the two segments of the divided sciatic were united accurately in the old relationship, an exactly parallel course as regards the time taken for restoration of function was exhibited.—A paper was also communicated by Mr. Bellyse Baildon, at present lecturer in English in the University of Vienna, on the rimes in the authentic poems of William Dunbar.

PARIS.

Academy of Sciences, April 10.—M. van Tieghem in the chair.—On the interpretation of a limited number of observations, by M. Hatt. The author discusses the method of dealing with a measurement which deviates considerably from the others when the total number of observations is small, recently proposed by M. Vallier, and shows by means of a particular case that the treatment suggested is not always trustworthy.—On the applications of aluminium, by M. Henri Moissan. A criticism of the recent work of M. Ditte on this subject. M. Moissan points out that the aluminium used by M. Ditte in his researches was not rigorously analysed, and that he attached no importance to the small impurities of the metal, although these latter may well have had a considerable influence upon the results. Aluminium is now produced in a much purer state than was the case five years ago, a series of seven analyses, made in 1893, giving a mean percentage of 93·4, as against 97·8 per cent. for aluminium made four years later. The fact that the aluminium water vessels used in Madagascar were mounted in contact with iron, may also have influenced the rapidity of corrosion by the electrolytic action which would be set up at the expense of the aluminium.—The production of electromotive forces by the displacement of masses of liquid of different conductivities submitted to the magnetic action, by M. R. Blondlot. If a vessel containing two layers of zinc sulphate of different concentrations, into each of which is plunged an electrode of amalgamated zinc, is placed in a strong magnetic field, when the liquids are mixed, differences of electromotive force can be observed between the two electrodes by means of a capillary electrometer. The theory of the results is fully discussed.—The favourable action exercised by the pancreas on alcoholic fermentation, by MM. R. Lépine and Martz.—Application of the *criterium of Tisserand* to the small planets, by M. Jean Mascart.—On a differential linear equation, by M. A. Liapounoff. A discussion of the equation

$$\frac{d^2y}{dx^2}+\mu p(x)y=0,$$

where $p(x)$ is a given continuous function of a real variable x, having a period ω, and μ an arbitrary parameter.—A new interpretation of the condition necessary for a double integral, taken over a surface, to be independent of the boundary of the surface, by M. Ch. Méray.—On the homography of the theory of beams, by M. Andrade.—On surfaces of plain or spherical lines of curvature, by M. Émile Waelsch.—Three formulæ of great generality relating to curves in space, by M. N. I. Hatzidakis.—On the effect of an increase or decrease of pressure upon the electrolytic interrupter, by M. A. Le Roy. Both a decrease and an increase of the atmospheric pressure interferes with the working of the Wehnelt interrupter.—Some working conditions of the Wehnelt electrolytic interrupter, by M. Paul Bary.—On the variation of the electrical resistance of metals and their alloys, due to torsion, by M. Coloman de Szily. To eliminate the effects of temperature, the alloy constantin was chosen, the coefficient of increase of resistance with temperature of which is extremely small, and the work carried out in a room the temperature of which did not vary 0°·1 C. during the experiments. The resistance was found to increase with the angle of torsion; up to the elastic limit of the material these two quantities were proportional, but for higher angles of torsion the resistance increased more rapidly than this.—Points correlative to the points of Bravais, by M. Pierre Lefebvre.—On a new method of preparing the silicide of iron, FeSi, by M. P. Lebeau. A mixture of iron filings and silicide of copper, the latter being in excess, is heated in the electric furnace. The resulting ingot consists of a mass of crystals of iron silicide, cemented together by silicide of copper, the latter being readily removed by dilute nitric acid.—The preparation and properties of a crystallised sub-phosphate of copper, by M. Georges Maronneau. Copper phosphate and carbon heated together in suitable proportions in the electric furnace, give a crystallised compound of copper and phosphorus of the composition $\mathrm{Cu_2P}$.—On the thermal properties of lime prepared at different temperatures, by M. Henri Gautier. Limes prepared at different temperatures show remarkable differences in the rate of hydration when placed in water, lime fused in the electric furnace being so slowly acted upon that it is possible to accurately determine its density in water. It was thought that these differences might be due to differences in the molecular state of the lime, which would correspond to variations in the heats of solution. This, however, was not borne out by the experiments, samples of lime prepared at 1000°, 1200°, 2000°, and the temperature of the electric furnace all giving the same results in the calorimeter.—Actino-photometer based upon the luminosity of phosphorescent zinc sulphide and the intensity or nature of the exciting sources of light, by M. Charles Henry.—On dextrine considered as a reserve material, by M. Leclerc du Sablon.—On some new anatomical peculiarities in the fatty grains (cotyledons and endosperm), by M. Edouard Heckel.—On an extraordinary halo observed at Paris, April 5, 1899, by M. Joseph Jaubert.

DIARY OF SOCIETIES.

THURSDAY, April 20.

Royal Society, at 4.30.—The Physiological Action of Choline and Neurine: Dr. Mott, F.R.S., and Dr. Halliburton, F.R.S.—Intestinal Absorption, especially on the Absorption of Serum, Peptone, and Glucose: Prof. R. Waymouth Reid, F.R.S.—Studies on the Morphology of Spore-producing Members. No. 4. The Leptosporangiate: Prof. F. O. Bower, F.R.S.—Note on the Fertility of Different Breeds of Sheep, with Remarks on the Prevalence of Abortion and Barrenness therein: W. Heape.—Some further Remarks on Red-water or Texas Fever: A. Edington.

Royal Institution, at 3.—The Atmosphere: Prof. J. Dewar, F.R.S.

Linnean Society, at 8.—The Botany of the Ceylon Patanas: H. W. H. Pearson.—Imitation as a Source of Anomalies: Prof. R. J. Anderson.—List of British and Irish Spiders.—Rev. O. Pickard Cambridge, F.R.S.

Chemical Society, at 8.—Some Dipyridyl Derivatives from Citrazinic Acid: W. J. Sell and H. Jackson.—On the Interaction of Mercurous and Mercuric Nitrites, with the Nitrites of Silver and Sodium: P. C. Ray.—The Synthesis and Preparation of Terebic and Terpenylic Acids: W. Trevor Lawrence.—The Allotropic Modifications of Phosphorus: D. L. Chapman.—β-Isopropyl Glutaric Acid: F. H. Howles and J. F. Thorpe.—Ethyl Ammoniumsulphite: Edward Divers and Masataka Ogawa.—Ethyl Ammonium Selenite and Non-existence of Amidoselenites (Selenosamates): Edward Divers and Seihachi Hada.

Institution of Civil Engineers, at 8.—"James Forrest" Lecture: Magnetism: Prof. J. A. Ewing, F.R.S.

FRIDAY, April 21.

Royal Institution, at 9.—Structure of the Brain in Relation to its Functions: Frederick Walker Mott. F.R.S.

Physical Society, at 5.—On the Effect of a Solid Conducting Sphere in a Variable Magnetic Field on the Magnetic Induction at a Point Outside: C. S. Whitehead.—Demonstration of Richards's Method of Standardising Thermometers: Dr. R. A. Lehfeldt.

Epidemiological Society, at 8.30.—The Relations of Bacteriology to Epidemiology: Dr. F. R. Blaxall.

SATURDAY, April 22.

Geologists' Association.—Excursion to Staines. Director: W. Whitaker, F.R.S. Leave Waterloo at 1.57 p.m.; arrive Staines Junction 2.36 p.m.

MONDAY, April 24.

Society of Arts, at 8.—Leather Manufacture: Prof. Henry R. Procter.

Royal Geographical Society, at 8.30.—Journeys on the Nyasa-Tanganyika Plateau: Captain F. R. F. Boileau, R E., and L. A. Wallace.

Society of Chemical Industry, at 8.30.—The Relations of the Society to Chemical Engineering and to Industrial Research: George Beilby.

Institute of Actuaries, at 5.30.—On the Requirements of the Life Assurance Companies Act, 1870, in regard to Valuation Returns, with some Notes on the Classification and Valuation of Special Policies: Ralph Todhunter.

TUESDAY, April 25.

Royal Institution, at 3.—Zebras and Zebra Hybrids: Prof. J. Cossar Ewart, F.R.S.

Anthropological Institute, at 8.30.—Ju Ju Laws and Customs of the Niger Delta: Le Comte C. de Cardi. Illustrated by Lantern Slides and a variety of objects from West Africa.—Exhibition of Lantern Slides of Views in the Colony of Sierra Leone and the Protectorate, with Short Descriptive Account: T. J. Alldridge.

Institution of Civil Engineers, at 8.—Annual General Meeting of Corporate Members.

Royal Photographic Society, at 8.—A Demonstration of the Making of Glass Diaphragms: Thomas Bolas.

WEDNESDAY, April 26.

Society of Arts, at 8.—Coal Supplies: T. Forster Brown.

Geological Society, at 8.—On Limestone-Knolls in the Craven District of Yorkshire and elsewhere: J. E. Marr, F.R.S.—The Limestone-Knolls below Thorpe Fell, between Skipton and Grassington in Craven: J. R. Dakyns.—On Three Species of Lamellibranchs from the Carboniferous Rocks of Great Britain: Dr. Wheelton Hind.

THURSDAY, April 27.

Royal Society, at 4.30.

Royal Institution, at 3.—The Atmosphere: Prof. J. Dewar, F.R.S.

Institution of Electrical Engineers, at 8.—Experiments on Alternate Current Arcs by Aid of Oscillographs: W. Duddell and E. W. Marchant. (Conclusion of Discussion.)—Capacity Measurements of Long Submarine Cables: J. Elton Young.

Institution of Mechanical Engineers, at 7.30.—Address by the President, Sir William H. White, K.C.B., F.R.S.

FRIDAY, April 28.

Royal Institution, at 9.—Some Features of the Electric Induction Motor: Prof C. A. Carus Wilson.

Institution of Mechanical Engineers, at 7.30.—Evaporative Condensers: Harry G. V. Oldham.

BOOKS AND SERIALS RECEIVED.

Books.—Elementary Physics and Chemistry, First Stage: R. A. Gregory and R. T. Simmons (Macmillan).—Th. Ipané: C. Graham (Unwin).—La Bicyclette, sa Construction et sa Forme: Dr. C. Bourlet (Paris, Gauthier-Villars).—Die Vegetation der Erde, iii.: Dr. G. Radde (Leipzig, Engelmann).—The Hunterian Oration delivered on February 14, 1899; Sir W. MacCormac (Smith, Elder).—Inwood's Tables of Interest and Mortality for the Purchasing of Estates, &c., 25th edition, revised, &c., by W. Schooling (Lockwood).—Lehrbuch der Algebra: Prof. H. Weber, Zweite Auflage, Zweiter Band (Braunschweig, Vieweg).—Geschichte der Physikalischen Experimentierkunst: Profs. Gerland and Traumüller (Leipzig. Engelmann).—The Natural Waters of Harrogate: Dr. F. W. Smith (Dawbarn).

Serials.—Zeitschritt für Physikalische Chemie, xxviii. Band, 3 Heft (Leipzig).—National Geographic Magazine, April (Washington).—The Atoll of Funafuti, Part 7 (Sydney).—Monthly Weather Review, December, 1898, and Annual Summary for 1898 (Washington).—Knowledge, April (High Holborn).—The Photo-Miniature, April (Dawbarn).—Transactions of the Astronomical and Physical Society of Toronto for the Year 1898 (Toronto).—American Journal of Science, April (New Haven).—Popular Astronomy, April (Northfield).—Atlantic Monthly, April (Gay).—Morphologisches Jahrbuch, 27 Band, 1 Heft (Leipzig).—Agricultural Gazette of New South Wales, February (Sydney).—Mémoires de la Société de Physique, &c., de Genève, Tome xxxiii. Part 1 (Genève).

CONTENTS.

PAGE

A Science of the Sciences. By **Prof. R. Meldola, F.R.S.** . . . 577
The Uganda Protectorate . . . 579
Our Book Shelf:—
  Elliot: "The Wild Fowl of the United States and British Possessions."—**R. L.** . . . 580
  Monck: "An Introduction to Stellar Astronomy" . 581
  Löb: "Electrolysis and Electrosynthesis of Organic Compounds."—**T. E.** . . . 581
  Ormerod: "Report of Observations of Injurious Insects and Common Farm Pests during the Year 1898, with Methods of Prevention and Remedy" . 581
  Duff: "Notes from a Diary" . . . 582
  Voorhees: "Fertilisers."—**R. W.** . . . 582
Letters to the Editor:—
  Further Notes on Recent Volcanic Islands in the Pacific.—**Sir W. J. L. Wharton, K.C.B., F.R.S.** 582
  Mosquitoes and Malaria.—The Manner in which Mosquitoes intended for Determination should be Collected and Preserved.—**Ernest L. Austen** . . 582
  Sunspots and Rainfall.—**Alex. B. MacDowall** . . 583
  Periodic Tides.—**W. Bell Dawson; Prof. A. Wilmer Duff** . . . 584
  The Natural Prey of the Lion.—**Kumagusu Minakata** . . . 585
The Present Standpoint in Spectrum Analysis. By **Sir Norman Lockyer, K.C.B., F.R.S.** . . . 585
Higher Commercial Education and the University of London. By **Sir Philip Magnus** . . . 588
William Rutherford. By **J. G. M.** . . . 590
Notes . . . 591
Our Astronomical Column:—
  Tuttle's Comet (1899 *b*) . . . 595
  Tempel's Comet (1873 II.) . . . 595
  Variable Star Notes . . . 595
  Spectrum of Saturn's Rings . . . 595
  The Sun's Mean Temperature . . . 595
Sources of Important Minerals. (*With Diagrams.*) . 596
On the Origin of Magneto-Optic Rotation. By **Dr. J. Larmor, F.R.S.** . . . 597
University and Educational Intelligence . . . 597
Scientific Serials . . . 598
Societies and Academies . . . 598
Diary of Societies . . . 600
Books and Serials Received . . . 600